

4/PAT'S
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Claims as enclosed to IPER

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1. A process for the catalytic preparation of melamine by decomposition of urea over solid catalysts using a main reactor and an after-reactor, wherein a catalyst having a low Lewis acidity is used in the main reactor and a catalyst having a higher Lewis acidity is used in the after-reactor.
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2. A process as claimed in claim 1, wherein the catalyst in the main reactor comprises at least one mineral from the group consisting of aluminum oxides, silicon oxides and aluminosilicates and mixtures thereof, preferably at least one mineral from the group consisting of bayerite, boehmite, gibbsite, montmorillonite, bentonite and muscovite, in particular bentonite.
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3. A process as claimed in claim 1 or 2, wherein the catalyst in the main reactor is present as a fluidized bed.
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4. A process as claimed in claim 3, wherein the main reactor has a conical or cylindrical, preferably conical, configuration.
5. A process as claimed in any of claims 1 to 4, wherein the Lewis acidity of the catalyst in the after-reactor has a volume-standardized surface Lewis acidity under reaction conditions which is higher by a factor of 1.5-6, preferably 3-5.
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6. A process as claimed in any of claims 1 to 5, wherein the acidity of the catalyst used in the main reactor is from 0.3 to 1.8 $\mu\text{mol/g}$, preferably from 0.5 to 30 1.5 $\mu\text{mol/g}$, in particular from 0.8 to 1.2 $\mu\text{mol/g}$.
7. A process as claimed in any of claims 1 to 6, wherein the acidity of the catalyst used in the after-reactor is from 2 to 12 $\mu\text{mol/g}$, preferably from 3 to 10 $\mu\text{mol/g}$, in particular from 3.5 to 6 $\mu\text{mol/g}$.
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8. A process as claimed in any of claims 1 to 7, wherein the catalyst in the after-reactor comprises from 0 to 60% by weight, preferably from 5 to 50% by weight,

of SiO_2 and from 100 to 40% by weight, preferably from 95 to 50% by weight, of Al_2O_3 .

9. A process as claimed in any of claims 1 to 8, wherein the catalyst in the after-reactor comprises at least one mineral from the group consisting of aluminum oxides, silicon oxides and aluminosilicates and mixtures of aluminum oxides, silicon oxides and/or aluminosilicates, preferably aluminosilicate.
10. A process as claimed in any of claims 1 to 9, wherein the catalyst in the after-reactor is activated at from 350 to 950°C, preferably from 450 to 750°C, before use.
11. A process as claimed in any of claims 1 to 10, wherein the catalyst in the after-reactor has a BET surface area of from 150 to 400 m^2/g , preferably from 200 to 350 m^2/g .
12. A process as claimed in any of claims 1 to 11, wherein the pore volumes of the catalysts are from 0.1 to 1.5 ml/g , preferably from 0.2 to 0.9 ml/g (N_2), or from 0.1 to 2.0 ml/g , preferably from 0.2 to 1.0 ml/g (Hg porosimetry), and the pore diameters are from 10 to 100 Å, preferably from 30 to 90 Å.
13. A process as claimed in any of claims 1 to 12, wherein the residence times in the after-reactor are from 0.1 to 20 s, preferably from 0.5 to 10 s, and the space velocities over the catalyst are from 0.05 to 2 g of $\text{HNCO}/\text{g (cat) • h}$, preferably from 0.1 to 1 g of $\text{HNCO}/\text{g (cat) • h}$.
14. A process as claimed in any of claims 1 to 13, wherein the residence times in the main reactor are from 1 to 50 s, preferably from 2 to 30 s, and the space velocities over the catalyst are from 20 to 700 kg of urea/t (cat) • h, preferably from 50 to 500 kg urea/t (cat) • h.
15. A process as claimed in any of claims 1 to 14, wherein the reaction in the main reactor is carried out at from 350 to 450°C, preferably from 380 to 420°C, and a pressure of from 1 to 15 bar, preferably from 1 to 10 bar, in particular from 5 to 8 bar absolute.

16. A process as claimed in any of claims 1 to 15, wherein the reaction in the after-reactor is carried out at from 350 to 500°C, preferably from 390 to 450°C, and a pressure of from 1 to 15 bar, preferably from 1 to 10 bar, in particular from 5 to 8 bar absolute.

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17. A process as claimed in any of claims 1 to 16, wherein the catalyst in the after-reactor is present as a fixed bed, preferably as shaped bodies, more preferably as monolith, hollow extrudate, star extrudate, pellets or crushed material, in particular as honeycomb.

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18. A process as claimed in any of claims 1 to 17, wherein the catalyst in the main reactor is present as a fluidized bed and that in the after-reactor is present as a fixed bed.

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